

Manual

PROAUTARCH BATTERY SYSTEM

24-1400-20 EAN: 7421098120914 Order-Nr: 01023	24-1800-25 EAN: 7421098120815 Order-Nr: 01022	24-2100-60 EAN: 7421098120952 Order-Nr: 01027
24-1600-20 EAN: 7421098120884 Order-Nr: 01025	24-2100-25 EAN: 7421098120907 Order-Nr: 01015	24-2400-60 EAN: 7421098120921 Order-Nr: 01026



PBS 24-XXXX-YY lithium-ion energy storage module with BMS

Generation 3

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1. Product description

The PBS 24-XXXX-YY modules are stackable lithium energy storage modules of the ProAutarch Battery Module System. With the system different setups can be put together for 24 VDC and 48 VDC system voltage. The modules of this system are provided in a rack housing with 2 height units (2U). The nominal voltage of a single module is 21.6 volts. Depending on setup the ProAutarch Battery System is able to provide different voltages, currents, wattages and discharge times.

2. Technical details of a single module

date: 02/15/2021						
Model	24-1400-20 Gen3	24-1600-20 Gen3	24-1800-25 Gen3	24-2100-25 Gen3	24-2100-60 Gen3	24-2400-60 Gen3
technology	lithium ion	lithium ion	lithium ion	lithium ion	lithium ion	lithium ion
system voltage	24 VDC	24 VDC	24 VDC	24 VDC	24 VDC	24 VDC
nominal voltage	21.6 V	21.6 V	21.6 V	21.6 V	21.6 V	21.6 V
nominal capacity	1.8 kWh	2.0 kWh	2.2 kWh	2.4 kWh	2.4 kWh	2.7 kWh
effective capacity at 25 C	1.4 kWh	1.6 kWh	1.8 kWh	2.1 kWh	2.1 kWh	2.4 kWh
discharge voltage range	25.2 V - 20.5 V	25.2 V - 20.5 V	25.2 V - 20.5 V	25.2 V - 20.5 V	25.2 V - 20.5 V	25.2 V - 20.5 V
charging voltage	25.2 V	25.2 V	25.2 V	25.2 V	25.2 V	25.2 V
max continuous charging current	20 A	20 A	25 A	25 A	60 A	60 A
max peak charging current for 30 seconds	30 A	30 A	30 A	30 A	90 A	90 A
recommended cont. charging current for max cycle life	17 A	18 A	20 A	22 A	22 A	25 A
max continuous discharging current	20 A	20 A	25 A	25 A	60 A	60 A
max power at fully charged module	500 Watt	500 Watt	550 Watt	550 Watt	1,500 Watt	1,500 Watt
max peak discharging current for 30 seconds	30 A	30 A	30 A	30 A	90A	90A
temperature range for charging and discharging	5-50 C	5-50 C	5-50 C	5-50 C	5-50 C	5-50 C
battery management system (BMS)	yes	yes	yes	yes	yes	yes
active balancing	yes	yes	yes	yes	yes	yes
protective functions (voltage/current/short circuit)	yes	yes	yes	yes	yes	yes
temperature sensor integrated	yes	yes	yes	yes	yes, 3 pcs	yes, 3 pcs
interfaces	no	no	no	no	optional CAN 2.0, RS485 modbus	optional CAN 2.0, RS485 modbus
life expectancy as solar energy storage at 25C until 50% cap	10 years	10 years	10 years	10 years	10 years	10 years
life expect. as emergency power storage at 25C until 50% cap	10 years	10 years	10 years	10 years	10 years	10 years
weight	16.7 kg	16.7 kg	16.7 kg	16.7 kg	17.2 kg	17.2 kg
enclosure	19" casing, 2 HU, steel, alloy	19" casing, 2 HU, steel, alloy	19" casing, 2 HU, steel, alloy	19" casing, 2 HU, steel, alloy	19" casing, 2 HU, steel, alloy	19" casing, 2 HU, steel, alloy
stackable without rack	up to 4 modules	up to 4 modules	up to 4 modules	up to 4 modules	up to 4 modules	up to 4 modules
dimensions width x depth x height cm	44 x 30 x 8.8	44 x 30 x 8.8	44 x 30 x 8.8	44 x 30 x 8.8	44 x 30 x 8.8	44 x 30 x 8.8
dimensions incl. front cover, feet, terminals and handles	48 x 33.5 x 9.2	48 x 33.5 x 9.2	48 x 33.5 x 9.2	48 x 33.5 x 9.2	48 x 33.5 x 9.2	48 x 33.5 x 9.2

3. Technical details of a setup with several modules

date: 12/21/2021									
Total effective Capacity (kWh)	No of modules	Type of modules	Setup	System-voltage	Max. continuous discharging current	Min. rated power of discharging inverter	Charging voltage	Opt. charging current	Minimum discharging wiring / silicone copper with max lenght of 2 m
1.4	1	24-1400-20	single	24 VDC	20 A	500 W	25.2 V	17 A	10AWG / 6mm ²
2.8	2	24-1400-20	parallel (2P)	24 VDC	40 A	1000 W	25.2 V	34 A	6AWG / 13mm ²
4.2	2	24-1400-20	series (2S)	48 VDC	20 A	1000 W	50.4 V	17 A	12AWG / 4mm ²
4.2	3	24-1400-20	parallel (3P)	24 VDC	60 A	1500 W	25.2 V	51 A	5AWG / 16mm ²
5.6	4	24-1400-20	parallel (4P)	24 VDC	80 A	2000 W	25.2 V	68 A	4AWG / 21mm ²
5.6	4	24-1400-20	2P2S	48 VDC	40 A	2000 W	50.4 V	34 A	10AWG / 6mm ²
7.0	5	24-1400-20	parallel (5P)	24 VDC	100 A	2500 W	25.2 V	85 A	2AWG / 34mm ²
8.4	6	24-1400-20	3P2S	48 VDC	60 A	3000 W	50.4 V	51 A	7AWG / 10mm ²
11.2	8	24-1400-20	4P2S	48 VDC	80 A	4000 W	50.4 V	68 A	6AWG / 13mm ²
14.0	10	24-1400-20	5P2S	48 VDC	100 A	5000 W	50.4 V	85 A	5AWG / 16mm ²
1.6	1	24-1600-20	single	24 VDC	20 A	500 W	25.2 V	18 A	10AWG / 6mm ²
3.2	2	24-1600-20	parallel (2P)	24 VDC	40 A	1000 W	25.2 V	36 A	6AWG / 13mm ²
4.8	2	24-1600-20	series (2S)	48 VDC	20 A	1000 W	50.4 V	18 A	12AWG / 4mm ²
4.8	3	24-1600-20	parallel (3P)	24 VDC	60 A	1500 W	25.2 V	54 A	5AWG / 16mm ²
6.4	4	24-1600-20	parallel (4P)	24 VDC	80 A	2000 W	25.2 V	72 A	4AWG / 21mm ²
6.4	4	24-1600-20	2P2S	48 VDC	40 A	2000 W	50.4 V	36 A	10AWG / 6mm ²
8.0	5	24-1600-20	parallel (5P)	24 VDC	100 A	2500 W	25.2 V	90 A	2AWG / 34mm ²
9.6	6	24-1600-20	3P2S	48 VDC	60 A	3000 W	50.4 V	54 A	7AWG / 10mm ²
12.8	8	24-1600-20	4P2S	48 VDC	80 A	4000 W	50.4 V	72 A	6AWG / 13mm ²
16.0	10	24-1600-20	5P2S	48 VDC	100 A	5000 W	50.4 V	90 A	5AWG / 16mm ²
1.8	1	24-1800-25	single	24 VDC	25 A	550 W	25.2 V	20 A	8AWG / 8mm ²
3.6	2	24-1800-25	parallel (2P)	24 VDC	50 A	1100 W	25.2 V	40 A	5AWG / 16mm ²
5.4	2	24-1800-25	series (2S)	48 VDC	25 A	1100 W	50.4 V	20 A	10AWG / 6mm ²
5.4	3	24-1800-25	parallel (3P)	24 VDC	75 A	1650 W	25.2 V	60 A	4AWG / 21mm ²
7.2	4	24-1800-25	parallel (4P)	24 VDC	100 A	2200 W	25.2 V	80 A	2AWG / 34mm ²
7.2	4	24-1800-25	2P2S	48 VDC	50 A	2200 W	50.4 V	40 A	8AWG / 8mm ²
9.0	5	24-1800-25	parallel (5P)	24 VDC	125 A	2750 W	25.2 V	100 A	2AWG / 34mm ²
10.8	6	24-1800-25	3P2S	48 VDC	75 A	3300 W	50.4 V	60 A	6AWG / 13mm ²
14.4	8	24-1800-25	4P2S	48 VDC	100 A	4400 W	50.4 V	80 A	5AWG / 16mm ²
18.0	10	24-1800-25	5P2S	48 VDC	125 A	5500 W	50.4 V	100 A	4AWG / 21mm ²
2.1	1	24-2100-25	single	24 VDC	25 A	550 W	25.2 V	22 A	8AWG / 8mm ²
4.2	2	24-2100-25	parallel (2P)	24 VDC	50 A	1100 W	25.2 V	44 A	5AWG / 16mm ²
6.3	2	24-2100-25	series (2S)	48 VDC	25 A	1100 W	50.4 V	22 A	10AWG / 6mm ²
6.3	3	24-2100-25	parallel (3P)	24 VDC	75 A	1650 W	25.2 V	66 A	4AWG / 21mm ²
8.4	4	24-2100-25	parallel (4P)	24 VDC	100 A	2200 W	25.2 V	88 A	2AWG / 34mm ²
8.4	4	24-2100-25	2P2S	48 VDC	50 A	2200 W	50.4 V	44 A	8AWG / 8mm ²
10.5	5	24-2100-25	parallel (5P)	24 VDC	125 A	2750 W	25.2 V	110 A	2AWG / 34mm ²
12.6	6	24-2100-25	3P2S	48 VDC	75 A	3300 W	50.4 V	66 A	6AWG / 13mm ²
16.8	8	24-2100-25	4P2S	48 VDC	100 A	4400 W	50.4 V	88 A	5AWG / 16mm ²
21.0	10	24-2100-25	5P2S	48 VDC	125 A	5500 W	50.4 V	110 A	4AWG / 21mm ²

date: 12/21/2021									
Total effective Capacity (kWh)	No of modules	Type of modules	Setup	System-voltage	Max. continuous discharging current	Min. rated power of discharging inverter	Charging voltage	Opt. charging current	Minimum discharging wiring / silicone copper with max lenght of 2 m
2.1	1	24-2100-60	single	24 VDC	60 A	1500 W	25.2 V	22 A	4AWG / 21mm ²
4.2	2	24-2100-60	parallel (2P)	24 VDC	120 A	3000 W	25.2 V	44 A	2AWG / 34mm ²
6.3	2	24-2100-60	series (2S)	48 VDC	60 A	3000 W	50.4 V	22 A	7AWG / 10mm ²
6.3	3	24-2100-60	parallel (3P)	24 VDC	180 A	4500 W	25.2 V	66 A	00AAG / 50mm ²
8.4	4	24-2100-60	parallel (4P)	24 VDC	240 A	6000 W	25.2 V	88 A	00AWG / 70mm ²
8.4	4	24-2100-60	2P2S	48 VDC	120 A	6000 W	50.4 V	44 A	4AWG / 21mm ²
10.5	5	24-2100-60	parallel (5P)	24 VDC	300 A	7500 W	25.2 V	110 A	000AWG / 85mm ²
12.6	6	24-2100-60	3P2S	48 VDC	180 A	9000 W	50.4 V	66 A	2AWG / 34mm ²
16.8	8	24-2100-60	4P2S	48 VDC	240 A	12000 W	50.4 V	88 A	1AWG / 42mm ²
21.0	10	24-2100-60	5P2S	48 VDC	300 A	15000 W	50.4 V	110 A	00AAG / 50mm ²
2.4	1	24-2400-60	single	24 VDC	60 A	1500 W	25.2 V	25 A	4AWG / 21mm ²
4.8	2	24-2400-60	parallel (2P)	24 VDC	120 A	3000 W	25.2 V	50 A	2AWG / 34mm ²
7.2	2	24-2400-60	series (2S)	48 VDC	60 A	3000 W	50.4 V	25 A	7AWG / 10mm ²
7.2	3	24-2400-60	parallel (3P)	24 VDC	180 A	4500 W	25.2 V	75 A	00AAG / 50mm ²
9.6	4	24-2400-60	parallel (4P)	24 VDC	240 A	6000 W	25.2 V	100 A	00AWG / 70mm ²
9.6	4	24-2400-60	2P2S	48 VDC	120 A	6000 W	50.4 V	50 A	4AWG / 21mm ²
12.0	5	24-2400-60	parallel (5P)	24 VDC	300 A	7500 W	25.2 V	125 A	000AWG / 85mm ²
14.4	6	24-2400-60	3P2S	48 VDC	180 A	9000 W	50.4 V	75 A	2AWG / 34mm ²
19.2	8	24-2400-60	4P2S	48 VDC	240 A	12000 W	50.4 V	100 A	1AWG / 42mm ²
24.0	10	24-2400-60	5P2S	48 VDC	300 A	15000 W	50.4 V	125 A	00AAG / 50mm ²

4. Before commissioning

After transporting the module, leave it to stand in a warm, dry place for at least 12 hours to allow any condensate that may have formed inside to evaporate. Pay attention to the LCD display. The batteries are legally required to be shipped with a low charge. The right display for the battery voltage should therefore be between 19 and 21 volts on delivery. The left meter for current should read ± 000 amps. If the display shows other values, please contact the customer service of EnStoreTech GmbH and do NOT put the module into operation. Do not press the top button. This is only used to set up the display at the factory. These should not be changed.

5. Turning on and off the LCD display light

In order to be able to read the battery data well in the dark, the module is equipped with background lighting. Switch them on or off by briefly (below one second) pressing the lower button on the display.

6. Setting up the module(s)

If the module is to be set up individually or stacked, please glue the rubber feet supplied to the underside of the module. Place the module on a horizontal, flat, stable surface. The module must not wobble.



DANGER!

Do not screw anything into the enclosure to mount the feeds.

If you use several modules, you can stack them on top of each other. To do this, glue the rubber feet supplied under each module. You can stack up to four modules on top of each other. Never stack more than 4 modules on top of each other without a rack. Do not wire them directly, always use a fuse.



DANGER!

Never use without an external FUSE when commissioning.

7. Rack mounting of the modules

The modules are prepared for installation in standard 19-inch rack cabinets with minimum depth of 45 cm. Due to the weight rails are required for assembly, as an accessory for rack cabinets sold separately and before the installation of the modules in the rack cabinet stable must be screwed. In a rack-mount the rubber feet are not needed. Suitable rack cabinets can also be purchased at www.proautarch.de.



The front plate is not eligible to carry the weight of the module. Weight rails must be used when rack mounted.

8. Commissioning as a single module

Before you start wiring, make sure that the modules are switched off at the main switch. Use only suitable connecting cables. If you use the module individually, a 10mm² cable made of flexible copper braid and silicone insulation is sufficient for a cable length of up to 2 meters. If you are not sure, use the connecting [cables](#) that you can [purchase](#) together with the module at www.proautarch.de.

Turn the modules never directly to the inverter or the charger. Get an appropriate DC-FUSE between the red/plus wiring of the battery system and controller / inverter.

9. Commissioning of up to 5 modules in parallel setups with 24 VDC

Up to 5 modules of the same capacity and voltage can be connected in parallel setups described in section 3 „setup options“. Before you connect modules in parallel, make sure that they have the same voltage in advance, e.g. by discharging or charging all of them independently to the same voltage. If the voltage differs by more than 0.3V, the modules must not be connected in parallel without prior equalization.



DANGER!

Do not connect modules that differ more than 0.3 Volt

Before you start wiring, make sure that the modules are switched off at the main switch.

Care about the appropriate wiring. Always use the wiring specified in section 3 („setup options). You can find suitable cables at www.proautarch.de. Never turn the modules directly to the inverter or charger to but always get a FUSE between the battery system and controllers and inverters.



DANGER!

Do not use too small wiring.
You risk inflaming & fire.

10. Commissioning of up to 10 modules in setups with 48 VDC

Up to 10 modules of the same capacity and voltage can be connected in combined setups described in section 3 „setup options“. In this case the modules will be firstly grouped in two groups.

Each group will be connected in parallel. Before you connect several modules in parallel, make sure that they have the same voltage, e.g. by discharging or charging all of them independently to the same voltage. If the voltage differs by more than 0.3V, the modules must not be connected in parallel without prior equalization. Before you start wiring, make sure that the modules are switched off at the main switch.



DANGER!

Do not connect modules that differ more than 0.3 Volt

Then connect the two groups in series. As a result, the system voltage will be 48V instead of 24V.

Care about the appropriate wiring. Always use the minimum wiring specified in section 3 („setup options). Never turn the modules directly to the inverter or charger to but always get a FUSE between the battery system and controllers and inverters.



DANGER!

Do not use too small wiring.
You risk inflaming & fire.

11. Conditions for reaching the maximum cycle life

Each module is made up of high-quality, individually tested, selected and refurbished lithium-ion batteries connected in the 40P6S setup. Cycle life will depend on, number of cycles, depth of discharge, maximum d discharging currents and temperatures while charging. For a maximum life time, the modules should not more be charged as with the recommended charging current specified in the section 2 and 3. In addition, it should not be discharged lower than 20.5V. 10 years of use as a solar energy storage system or as an emergency power storage, with 200 cycles per year until the capacity falls below 50% of the original capacity, can be achieved in this way.

12. Active battery management system (active BMS)

An active BMS is installed with automatic cell voltage difference compensation to avoid cell drift during continuous operation. The BMS has the following safety functions:

1. Automatic discharging interruption when under 16 V (Recommended external shutdown at 20.5 V)
2. Automatic charging interruption when charging with a voltage above 25.2 V.
3. Short-circuit protection for currents greater than 90 A.
4. Overtemperature protection above 50 degrees Celsius cell temperature when charging and 70 degrees Celsius cell temperature when discharging.

Note: The charging and discharging interruption function is designed as an emergency shutdown. The battery module must not be operated without a charge controller or hybrid inverter , which keeps the charging voltages and currents within the recommended limits and only charges at temperatures above 5 degrees Celsius. eg solar charge controller with individual Lilon -voltages and currents. Please see a variety of charging regulators and inverters at www.pproautarch.de

Note: After the module has the emergency shutdown is activated, it can only be put into operation after some time. To realize this the main switch needs to be switched of for at least 1 hour. During this time it is neither possible to charge nor discharge. Until reactivation, the module remains disconnected from the load despite the main switch being in the ON position.

13. Casing

The main switch is used for commissioning / decommissioning. The permanent LCD display shows all relevant battery values of the module. The M8 terminals for cable lugs provide space for attaching 3 cable lugs at the same time.

Weight: 16 kg

Dimensions of the 19-inch rack housing: 8.8 cm high (2 U) x 44 cm wide x 30 cm deep

Overall dimensions: 9.2 cm height including feet x 48.0 cm wide x 33.5 cm depth including aperture

14. Return of used or no longer used modules

Used or unused battery modules must not be disposed in the trash. You can resend your modules free of charge to the EnStoreTech GmbH. To do this, please contact customer service.

15. Manufacturer data and contact information

EnStoreTech GmbH

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